Business & Enterprise Systems

Integrity - Service - Excellence

BPD Configuration Management Training

12 October 2016

Course Objectives

- Become familiar with Configuration Management (CM) as a necessary recurring discipline across all phases of program management
- Understand the six key activities of CM and how they would be applied to your program
- Become familiar with the use of CM products, procedures, and templates in the BPD

Outline

- CM Defined
- CM Benefits
- Key CM Activities
  - Configuration Planning and Management
  - Configuration Identification
  - Configuration Status Accounting
  - Configuration Verification and Audit
  - Configuration Change Management
  - Data Management
- BPD CM Resources
- Summary and Feedback

CM Defined

- **A field of management that focuses on establishing and maintaining consistency of a system's or product's performance and its functional and physical attributes with its requirements, design, and operational information throughout its life. [Mil-Hdbk-61A]**
- **A process for establishing and maintaining consistency of a product's performance, functional, and physical attributes with its requirements, design, and operational information throughout its lifecycle**

CM Guidance

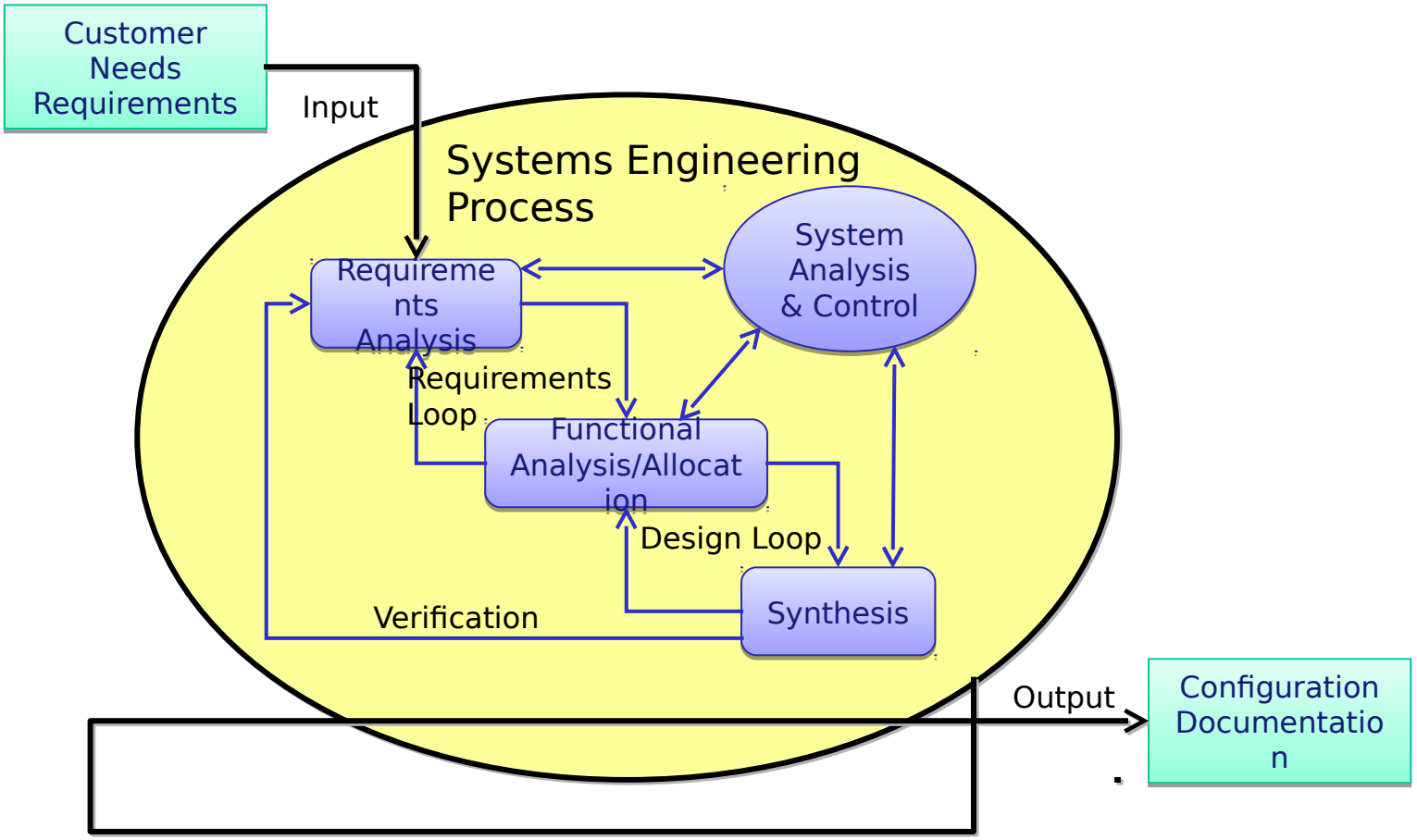
- **IEEE Std. 1042-1987 Guide to Software Configuration Management**
- **IEEE Std. 12207 Software Lifecycle Process Standards**
- **MIL-HDBK-61A Configuration Management Guidance 7 Feb 2001**
- **ISO 10007 Quality management - Guidelines for Configuration Management**
- **GEIA-HB-649 - Implementation Guide for Configuration Management**
- **ANSI/EIA-649-1998 National Consensus Standard for Configuration Management**
- **EIA-836 Consensus Standard for Configuration Management Data Exchange and Interoperability**
- **ANSI/EIA-632-1998 Processes for Engineering a System**
- **T[illegible] (PDR)**

With this much guidance, it MUST be important!

CM Purpose and Effects

- **Gives managers and stakeholders the ability to identify and understand the entire makeup of a system as it is being developed, managed, and maintained**
  - **Focus on verification of requirements fulfillment**
  - **CM products permit accurate integration of product with support artifacts for operation, maintenance, and integration**
- **Provides for product assurance of performance, documentation and predictability**
- **Controls and accounts for the functional and physical characteristics worldwide to ensure**
  - **Satisfaction of functional requirements**
  - **Supportability in the field and at the program office**

Relating CM to the BES Process Directory



IDEF-0 Process Flow Chart

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INPUTS

Mission Need
•Program Initiation
•Syst Eng. Reqmts, Funct Analysis, Alloc & Synthesis
•Logistics & Maintenance Plans
•Performance Measurements
•Communication

CONSTRAINTS

•Timing
•Resources
•Inadequate planning and preparation

Configuration Management Process

MECHANISMS/ FACILITATORS

•Management support
•Effective working relationship among Govt & Contractor CM, Program Management, Systems Engineering, Logistics & Quality
•Facilities
•Resources
•Training
•Guidance Handbooks & Standards

OUTPUTS/ RESULTS

•Documented CM process consistent with planning
•Consistent & appropriate:
-RFP & Contract CM/DM
-Acquisition of data; EDI
-Items identified
-Performance attributes identified and achieved
-Supported items documented
-Identification and marking sufficient for support
•Proposed changes made expeditiously
•Verified changes incorporated in all affected items, documents

•Status accounting database appropriate to each phase
•CM-competent contractor base
•CM process performance measured & continuously improved
•Lessons learned
•Program image enhanced

CM Benefits

- **CM principles are at the heart of sound business practices and provide:**
  - **A single description for acquisition and operation of a product, its components, and its outputs**
  - **Orderly identification of product and component attributes**
  - **Managed Control of product information and changes which improve its capabilities**
  - **Reduction in costly errors caused by ad hoc, erratic changes**
  - **Reductions in cost, risk, and liability**
  - **Consistency across functional user domain**
  - **Extension of product life via managed evolution**
  - **High level of confidence in product information and data**

Consequences of Poor CM

The risk of:

- Systems not built to actual customer requirements specifications
- Cost and schedule impacts due to difficulty finding or fixing bugs
- Different versions with the same problems
- Unapproved changes being incorporated without documentation
- Approved changes not incorporated
- Quality problems
- “Minor changes” that cause major problems
- No clear record of what has been created

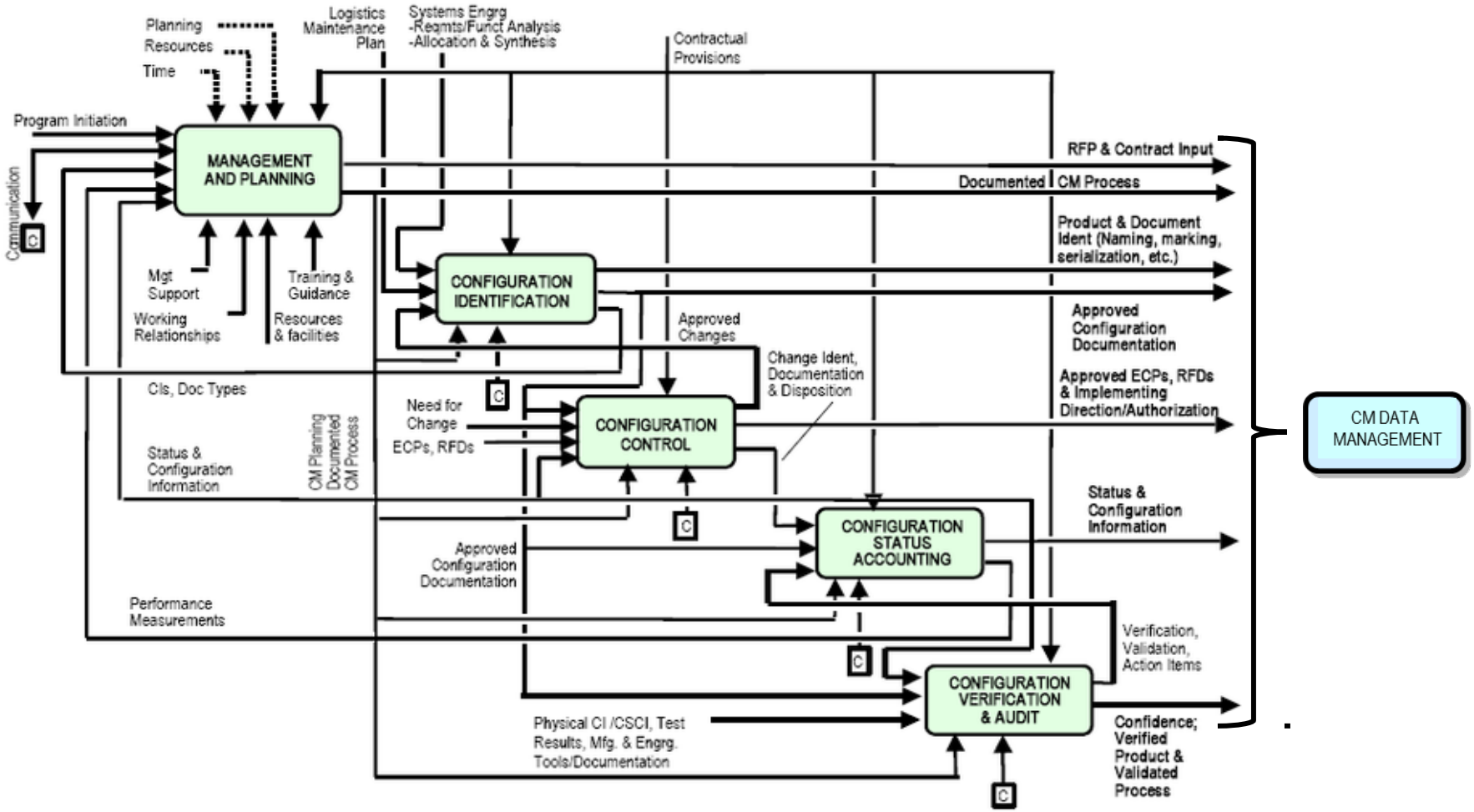
Scope of CM Includes:

- Physical client and server hardware products and versions
- Operating system software products and versions
- Application development software products and versions
- Technical architecture product sets and versions as they are defined and introduced
- Configuration item standards and definitions
- Networking products and versions
- Live application products and versions
- Definitions of hardware base configurations
- Definitions of packages of software releases
- Official Communications and Agreements
- Interface descriptions, standards, and versions
- Live documentation …and more

Key CM Activities

- CM process includes six key activities:
  - Configuration Planning and Management
  - Configuration Identification
  - Configuration Control/Change Management
  - Configuration Status Accounting
  - Configuration Verification and Audit
  - Configuration Data Management
- These activities are not performed sequentially or in a vacuum (although planning should be the first step)

Key CM Activities in Program Management



Key CM Activities
Configuration Planning and Management

- **Develop and implement a CM Plan (CMP)**
  - **Use BPD CMP Template at CMTM001**
  - **May be for an office with several projects, or a single program**
  - **Establish membership of a Configuration Control Board (CCB)**
  - **Ensure contract language satisfies CM requirements**
- **Select appropriate CM tools, techniques, and methods**
  - **Requirements, Risk, Data management tools**
  - **Manage the plan and measure its effectiveness**
  - **Ensure plan aligns with DoD and Industry Directives (MIL-HDBK-61A, AFI 63-1201)**
  - **Match CM Plan elements to UCI checklist items (ENGR 02)**
  - **Compare CM Plan elements to BPD Tailoring Worksheet (TWS)**

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Key CM Activities Configuration Identification

- **Identify the attributes that define every aspect of any Configuration Item (CI). A CI is a product (hardware or software) that has an end-user purpose**
  - **CI attributes are recorded in configuration documentation and baselined.**
  - **Selecting items to be placed under CM, whether government or contractor maintained, will vary by program**
    - **Program items the government generates and controls**
    - **Items the government uses to track industry progress/adherence (Ensure contract language supports government's ability to track CIs produced and maintained by contractor)**

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Purpose of Configuration Identification

- **Incrementally establish and maintain a definitive basis for control and status accounting of:**
  - **System functional processes and results**
  - **System physical makeup no matter how many iterations**
  - **System documentation, manuals, training**
  - **Management agreements, decisions, actions taken**
- **Provide a coherent process for version management**
  - **Assign naming conventions and unique identifiers**
  - **Enforce identification control and release specifications**
- **Minimize risks subject to undocumented or unauthorized changes**
- **Provide a significantly higher quality assurance**

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What Is a "Configuration Item?"

- **An aggregation of software or hardware that satisfies an end use function and is designated for separate CM**
  - **Hardware and software items are called CIs**
  - **Computer Software Configuration Items (CSCI); determined by each program and may include:**
    - **Code**
    - **Processes, reports, libraries, tables, views**
    - **Scripts (Including test scripts)**
    - **Architectures or Cascading Style sheets**
  - **Documentation CIs may include**
    - **Technical documents, functional documents**
    - **Weekly status documents, presentations, spreadsheets, etc**
    - **Test and training documents**
- **Any document or artifact that affects the physical or operational attributes of a system or component**

CIs are further aggregated to create baselines

Types of Baselines

- **Formal**
  - **Functional Baseline**
  - **Allocated Baseline**
  - **Product Baseline**
- **Informal (Other as Required)**
  - **Developmental Configuration**
  - **Internal: as Required (Resources Needed)**

Baselines are a snapshot in time of what a system or CI is and does

Baseline Description Functional Baseline (FBL)

- Describes the performance of the system or top-level CIs
  - Established near end of Materiel Solution Analysis or Define Need Phase via CCB or FRB meeting
  - Government-controlled if a contractor is doing the work
  - Contains high-level CIs
  - Includes functional, interoperability, and interface characteristics (defined as requirements by the customer)
  - Specifies the verification necessary to demonstrate required performance
  - Includes requirements documents, architecture, deficiency reports (if any), review minutes, etc.

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Baseline Description
Allocated Baseline (ABL)

- **Allocated baseline essentially means work is assigned to specific work packages in a work breakdown structure**
- **Derived from functional baseline after schedule is drafted**
  - **Established after completion of Preliminary Design Review**
  - **Each CI has an allocated baseline; contains detailed specifications**
  - **Work products include requirements documents (ConOps, SSS, SRS, GRS), release schedule, draft database/program/ system specification, draft design documents, system/software development plan (SDP), draft interface requirements agreements**

Baseline Description
Product Baseline (PBL)

- **A product baseline describes the functional & physical characteristics of project, program, or system**
  - **Established when the Test Readiness Review I (or similar activity) is completed with a formal decision to proceed**
  - **Defines the configuration of CIs during Production and Deployment and Operations and Support Phases**
  - **Includes environment summary and interoperability requirements**
  - **Consists of a data package that identifies form, fit, and function characteristics along with test and operational requirements**
  - **Includes a complete and approved release package**
  - **Verified by a Physical Configuration Audit prior to Full Deployment Decision (FDD)**

Key CM Activities
Configuration Status Accounting (CSA)

- **The process of recording and reporting on configuration baselines associated with each CI at any moment in time:**
  - **Continuously updating information needed to manage CIs effectively using an agreed upon information collection and recording system**
  - **Reports show program configuration identification at any given time, implementation status of approved changes, and audit information**
  - **Communicates output of other CM functions tailored to program**
  - **Ensures use of same or similar design and documentation information**

Key CM Activities
Configuration Status Accounting (CSA)

- **CSA provides effective management of CIs with PM assigning specific CSA duties to an individual who:**
  - **Maintains record of all configurations for all CIs, sequentially and according to CMP conventions**
  - **Has continuous, updated status of proposed and completed changes, deviations, and waivers**
  - **Communicates output of other CM functions tailored to program**
  - **Maintains complete configuration of all units or items in the system or program inventory of CIs.**
  - **Reports regularly to PM, CCB, and Stakeholders as appropriate for the size and importance of the program**

Typical CSA Report

- Current configuration lists
  - Baselines
  - CIs/CSCIs
  - Tests
- Historical configuration list
- Change requests and status of each
- Change implementation status (for each)
- Configuration verification list
- Software change traceability

Key CM Activities
Configuration Verification and Audit

- **Configuration Verification and Audit**
  - **Verification ensures products meet established requirements, standards, and contractual agreements**
  - **Verification that software products have been produced, correctly identified, and all change requests have been resolved**
  - **Audits ensure documentation matches the product (more formal activity than verification)**
    - **Functional configuration audit (FCA)**
    - **Physical configuration audit (PCA)**
- **Performed incrementally during design/development**
- **Confirms readiness to proceed to next step in design/ development process**

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CM Audits

- Validate requirements and accuracy of documents identifying the approved configuration identification
  - Functional Configuration Audit (FCA)
    - Formal examination of functional characteristics of a CI prior to acceptance
    - Verifies requirements via functional and allocated configuration documentation
  - Physical Configuration Audit (PCA)
    - Formal examination of the as-built configuration of a CI against its technical documentation; conducted prior to Full Deployment Decision
    - Determines whether testing requirements are satisfied and allows for product acceptance or rejection
    - Establishes or verifies CI's product baseline
- FCA and PCA are normally conducted by government prior to accepting a CI and prior to establishing product baseline

FCA/PCA Audit Process

- **Procedures and checklists to conduct FCA and PCA available at**
  Functional Configuration Audit Procedure or
  Physical Configuration Audit Procedure
  - **Review relevant audit procedure (FCA or PCA)**
  - **Conduct and document the audit**
  - **Ensure requirements traceability throughout audit**
- **FCA and PCA activities should be outlined in your CM Plan**

Configuration Control / Change Management

- A systematic process that ensures changes to released configuration documentation are properly identified, documented, evaluated for impact, approved by an appropriate level of authority, incorporated, and verified.
- The configuration management activity concerning: the systematic proposal, justification, evaluation, coordination, and disposition of proposed changes; and the implementation of all approved and released changes into:
  - the applicable configurations of a product,
  - associated product information, and
  - supporting and interfacing products and their associated product information.

Ref: MIL-HDBK-61A

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Key CM Activities
Configuration Change Management (CCM)

- CCM is a set of processes and approval stages required to change a CI's attributes and to re-baseline them
- Configuration Change Management, or Change Control is
  - A systematic approach to identify, justify, evaluate, approve, incorporate, verify, and document changes to a CI
  - Actions include
    - Identifying need for change
    - Documenting change requests
    - Assessing impact of change request from all aspects (FRB/RRB/CCB)
    - Following CCB Process
    - Documenting change request disposition (Configuration Change Directive (CCD) form found in BPD (SWFM008), or AFMC Form 518)
    - Planning, documenting, and implementing approved changes

Change Management

- Use an approved standard requirements/change tracking tool whenever possible
- Document all CRs and track them through the process using Configuration Change Directive (CCD) Form in BPD
- Ensure proposed changes reviewed in proper forums prior to implementation
  - Functional Review Board (FRB) composed of functional manager, system users, and program manager
  - Configuration Control Board (CCB), recommends approval, disapproval, or deferment of change requests

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Change Management
CM Typical Process

- User initiates Change Request
- Request evaluated by project personnel
  - Evaluation for technical and fiscal reasonableness
- Request for Change Proposal is prepared and sent to PMO
- PMO convenes FRB to make recommendations to CCB
- CCB convenes to evaluate and recommend change
  - If recommended, configuration change directive is issued
- PMO and LDTO test changes after completed
- CM documents all changes initiating new designation as appropriate for new release or new version
- [illegible]

Any baseline change should be a matter for the Configuration Control Board

Change Management
Configuration Control Board (CCB)

- **CCB comprised of senior reps from all functions that are or may be affected by proposed changes [ref: AFI 63-1201, *Life Cycle Systems Engineering*]**
  - **Affords comprehensive review prior to change approval, change disapproval, or deferral decisions being made**
  - **Authority for approval (or not) of proposed waivers & deviations**
  - **Typical CCB composition:**
    - **Portfolio Manager**
    - **Program Manager**
    - **Functional User (Customer)**
    - **Configuration Manager**
    - **Lead System Engineer**
    - **Finance Manager**
    - **Contracting Officer**
    - **Contractor (depending on type of discussion)**

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Change Management
The CCB Process

- Assign and contact membership
- Create CCB charter
  - Initially bring board together to become acquainted with the program and each other, and create a set of by-laws
- Convene board
  - Board usually convened to address one or more proposed change that may affect the program or system baseline
- Review proposed changes
- Recommend changes to board chair, who will cause the action to become a matter of CCB minutes
- Issue a Configuration Change Directive (CCD)
- Record decisions or findings in minutes which become a CI

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Change Management Change Classifications

- **Class I**
  - **Changes proposed to approved functional, allocated or product configuration documentation that affects the physical or functional requirements to include cost, warranties or contract milestones**
- **Class II**
  - **Any change that is not Class I**

Change Management Deviations/Waivers

- **Deviations/Waivers – do not result in a permanent change to a product's configuration; does not change the configuration baseline documentation**
  - **Deviations – written authorization to depart from a particular requirement(s) of an item's current approved configuration for a specified period of time**
  - **Waivers – written authorization to accept an item, after having been submitted for government inspection or acceptance, which is found to depart from specified requirements, but is considered suitable for use "as-is" or after repair**

Key CM Activities
Data Management

- **Data Management (DM)**
  - **Parallels CM process, and is used to:**
    - **Apply policies, systems, and procedures for identification and control of data requirements; to include naming conventions**
    - **Acquire CM data in a timely and economical way**
    - **Assure adequacy of data and analyze data use**
    - **Access, distribute, or communicate CM data to the point of use**
  - **Ensures integrity and security of data, by…**
    - **Applying identification rules to digital documents and files**
    - **Applying disciplined version control**
    - **Providing controlled access to data**
    - **Using agreed-upon rules for data change management and archiving**
    - **Maintaining product-data relationships**
    - **Protecting and applying appropriate markings on data**
    - **Assuring accurate data transmittal**
  - **Begs standardization of DM tools to the degree feasible**

Data Management
The Software Library

- **Each program should designate:**
  - **A single person responsible for maintaining library**
    - **Responsible for maintaining all CIs**
    - **Keeper of the keys to library access**
    - **Accounts for status of all project or system baselines**
  - **A secure storage area for custodial retention of software media and documentation received from software design groups, subcontractors, test environments or other government offices**
  - **Products to be contained in the library, to include**
    - **Version conventions and naming conventions of documents**
    - **Status accounting of computer programs and/or baseline groups of code**
    - **Associated documentation**
    - **Control of access to library**

Data Management
The Software Library

- **Proper Library maintenance prevents:**
  - **Unauthorized use**
  - **Duplication of software versions**
  - **Loss of**
    - **Documentation**
    - **Code**
    - **Version control**
- **Good Library maintenance and usage assures:**
  - **Complete understanding of contents and function of each version**
  - **Ability to go back in time to assess and fix problems**
  - **Ability to go forward with assurance of product quality**

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BPD CM Procedures

- CMTM001 – Configuration Management Plan (CMP) Template
  - Provides comprehensive template for creating and managing CMP
- CMPR001 – Configuration Management Planning
  - Reviews the CM Plan template, develops and maintains the project CMP
- CMPR002 – Baselines Establishment
  - Maintains established baselines; assigns CI identifiers to new and unassigned products, and places each CI selected into a controlled developmental tool
- CMPR003 – Baseline Management
  - Receives change request, logs in, and assigns tracking number; distributes for analysis; maintains established baselines
- CMPR004 – Configuration Control Board (CCB)
  - Administers all CCB procedures and actions; template for CCB Recorder; maintains list of CCB members; produces and distributes CCB agenda, maintains and tracks CCB minutes and action items

BPD CM Procedures

- **CMPR005 – Configuration Status Accounting (CSA)**
  - **Reviews new and established baselines. Generates CSA reports and archives**
- **CMPR006 – Functional Configuration Audit**
  - **Lists audit review materials; supports audit; serves as member of audit team; checks for completeness and accuracy; generates audit reports**
- **CMPR007 – Project Configuration Management Library**
  - **Maintains work products; controls access to baselined software; maintains artifact files**
- **CMPR008 – Software Migration**
  - **Prepares preliminary or final release package, migrating software from development to test phase; prepares production software for release to ops**
- **CMPR009 – Product Distribution**
  - **Prepare Release Request Letter; complete AF Form 636 and submit to Lead Developmental Test and Evaluation Organization (LDTO) Function**

BPD CM Procedures

- **CMPR010 – Action Item (AI)**
  - **Inputs AIs, facilitates tracking of AI status; maintains AI database**
- **CMPR012 – Electronic Product Distribution**
  - **Maintains turn-in of all applicable user documentation; completes AF Form 636 for submission to Lead Developmental Test and Evaluation Organization (LDTO) Function**
- **CMPR013 – Physical Configuration Audit**
  - **Gather audit review materials; Support audit; serve as member of audit team to audit test plans, procedures and results. Generate and distribute audit results**

Summary

- CM is a must for successful program management
  - Risk reduction
  - Quality assurance
  - Baseline discipline
- CM has six major functions
  - Management and Planning
  - Configuration Identification
  - Configuration Control/Change Management
  - Configuration Status Accounting
  - Configuration Auditing
  - Configuration Data Management
- CM facilitates achievement of cost, schedule and quality goals

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Recap and Feedback

- **Do you have any unanswered questions?**
- **Did we meet the objectives as stated?**
- **Don’t forget to request your CLPs!**
- **Please fill out a critique so we can improve this class for those who may attend in the future; written suggestions are very helpful**